

## ABSTRACT

An encoding and decoding method and apparatus support high speed multiplexing with a resolution of up to a single wavelength, in the speed range appropriate for photonic signal processing. Signals are split into daughter signals, having the exact wave form, absent amplitude equality, of the parent. Daughter signals may be serialized by a delay, spacing one daughter after another. A decoder splits the daughter signals into granddaughter signals and recombines them to provide noninterference, constructive interference, and destructive interference. By detection of photonic interference, a reconstituted output pulse may be formed, completely regenerating all information from the original signal. Pulse shaping may be accomplished by overlapping the times at which coherent daughter pulses exist. Overlaps between various daughter pulses may be used to provide amplitude increases in areas of interference having substantially reduced pulse durations, while lesser amplitudes remain elsewhere. Eventually, energy conservation may render lower amplitude regions below a noise level or cutoff level, thus concentrating the signal in a shorter duration, allowing more pulses to be encoded into a carrier, with less total energy density in the carrier for each pulse.

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